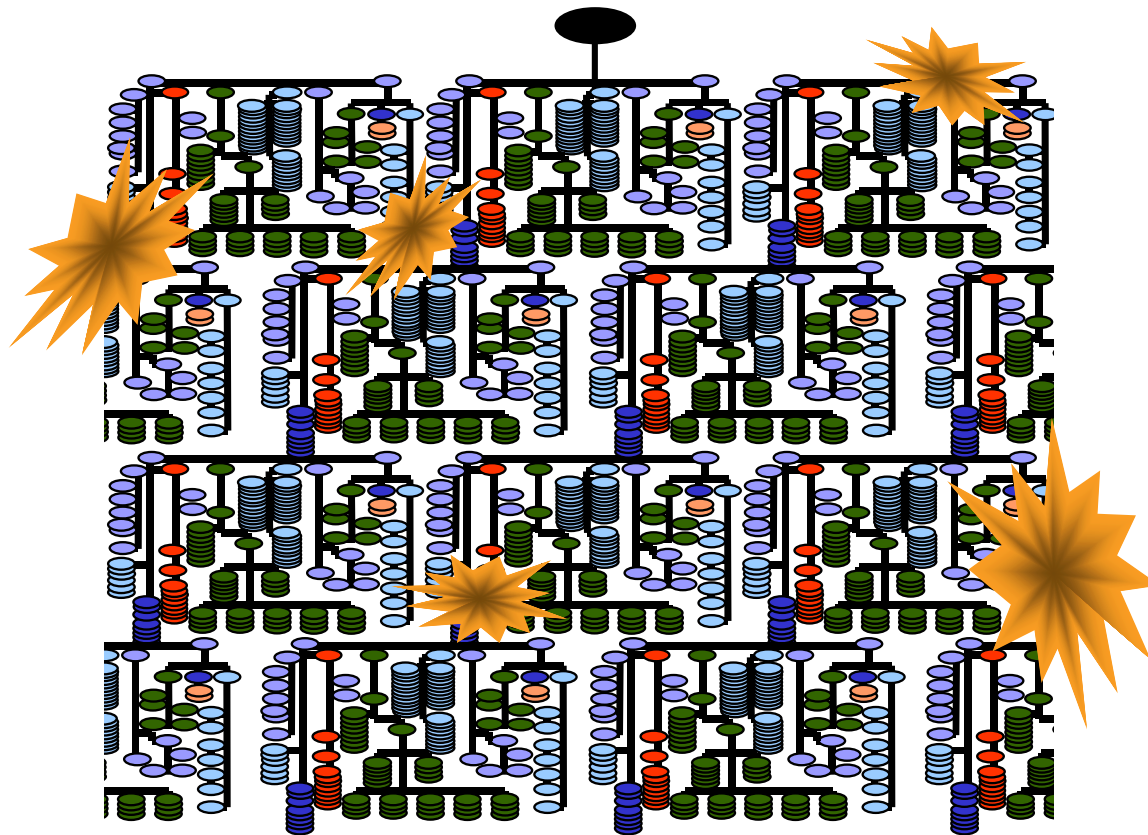DARPATECH 2000 ISO

ULTRA*LOG

Large-Scale, Robust, Secure Agent Technology for Today's Chaotic Wartime Environments

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Information Systems Office

1

DARPATECH 2000 ISO

ALP: Achieving Focused Logistics

Objective

Getting Control of the Logistics Pipeline...

– **Planning, Managing, and Providing Visibility**

– **All Echelons, All Phases of Operations**
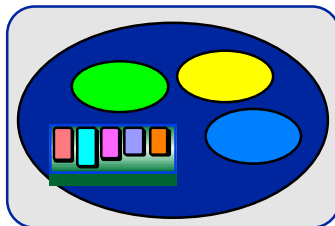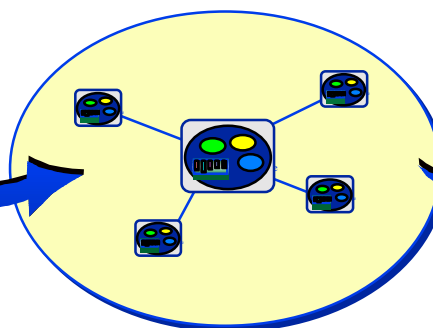
– **Continuous Planning and Execution**

In-Storage   **In-Process**   **In-Transit**

Approach

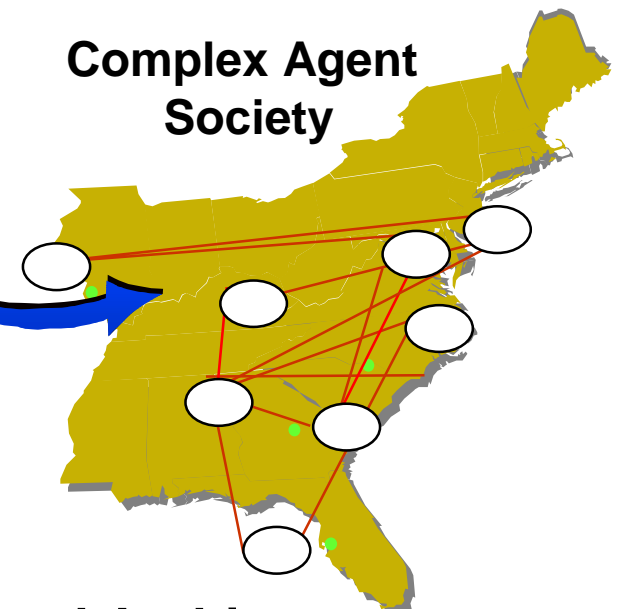**Basic Building Block Agent "Cluster"**   **Agent Community**   **Complex Agent Society**

First Large-Scale Distributed Agent-Based Architecture

Vision of a System of Systems
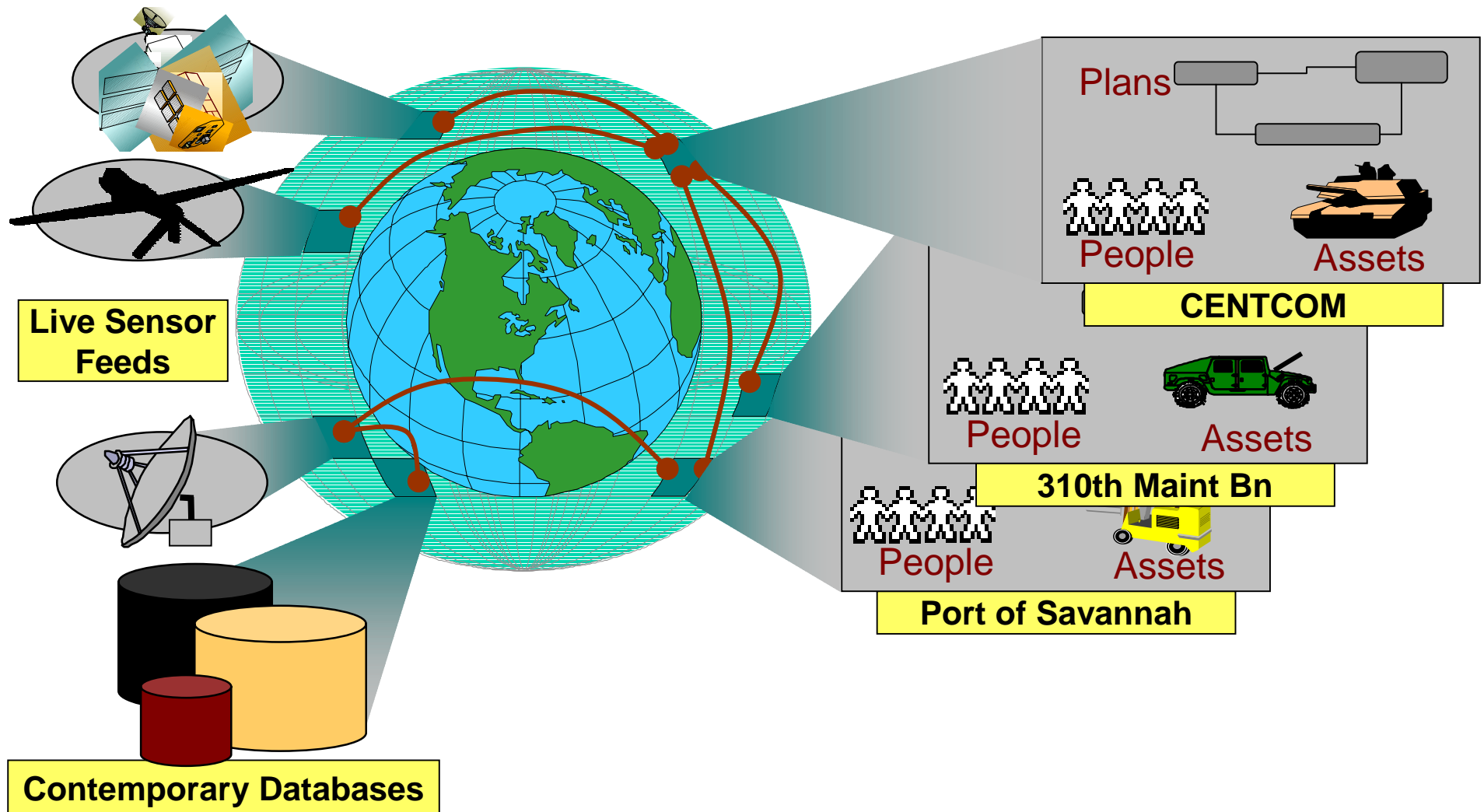
- **Automation**
- **Connectivity**
- **Flexibility**
- **Interoperability**
- **Evolvability**

Heterogeneous & Evolvable

Coalition/HNS

Contemporary Systems

Contemporary Systems

New Capability

Commercial

Contemporary Data Sources
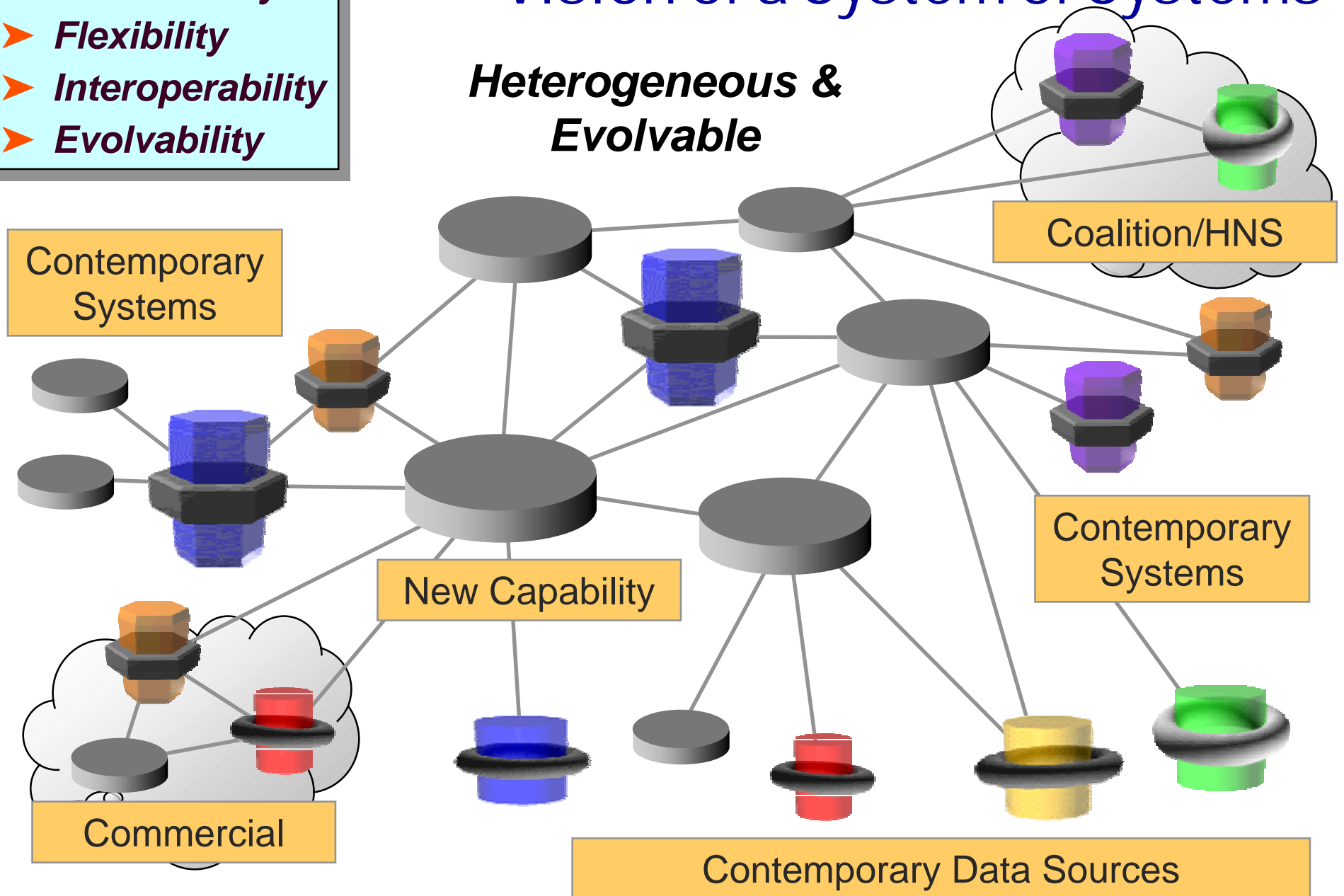
The Global Logistics Plan

DARPATECH
2000
ISO

Live Sensor Feeds

Contemporary Databases

Plans

People   Assets

CENTCOM

People   Assets

310th Maint Bn

People   Assets

Port of Savannah
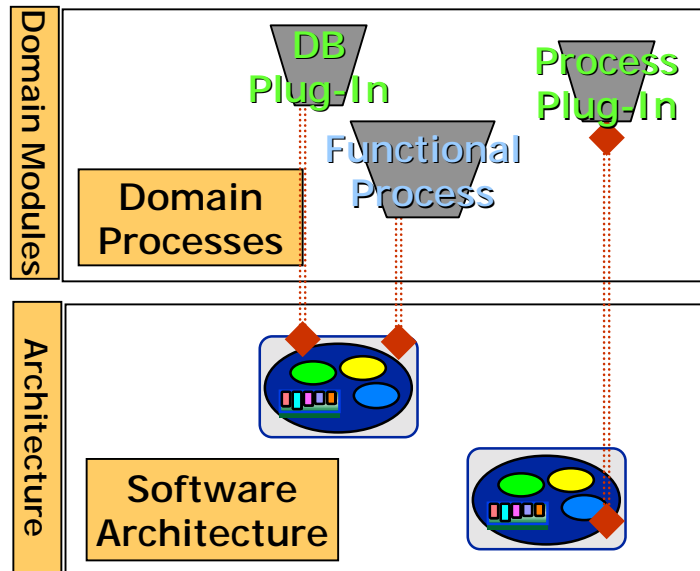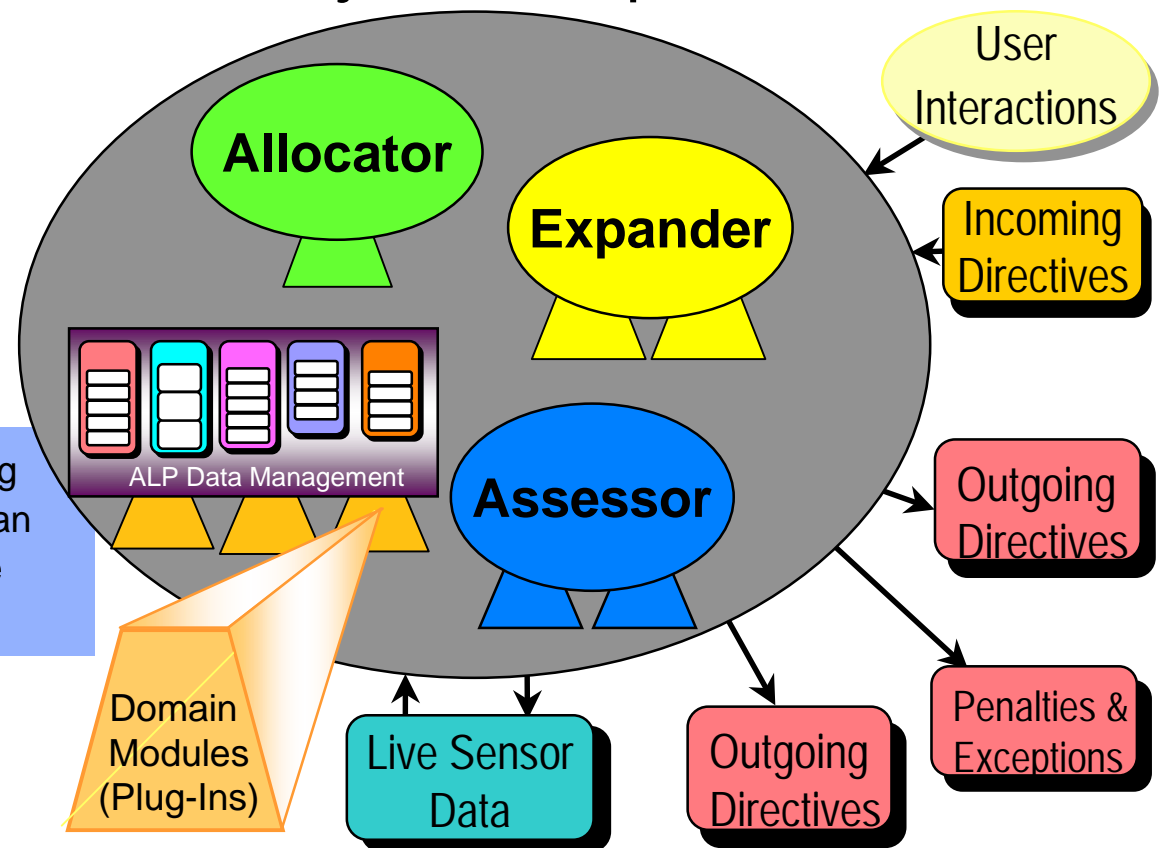
Cognitive Agent Architecture

1. Receive tasking
2. Decompose task into doable subtasks
3. Complete subtask or assign to subordinate
4. Monitor execution, replan as required
5. Periodically report status
6. Notify on task completion

Society

Domain Modules

DB Plug-In

Process Plug-In

Functional Process

Domain Processes

Architecture

Software Architecture

Software Architecture

Capturing the human cognitive process

Allocator

Expander

ALP Data Management

Assessor

Domain Modules (Plug-Ins)

User Interactions

Incoming Directives

Outgoing Directives

Live Sensor Data

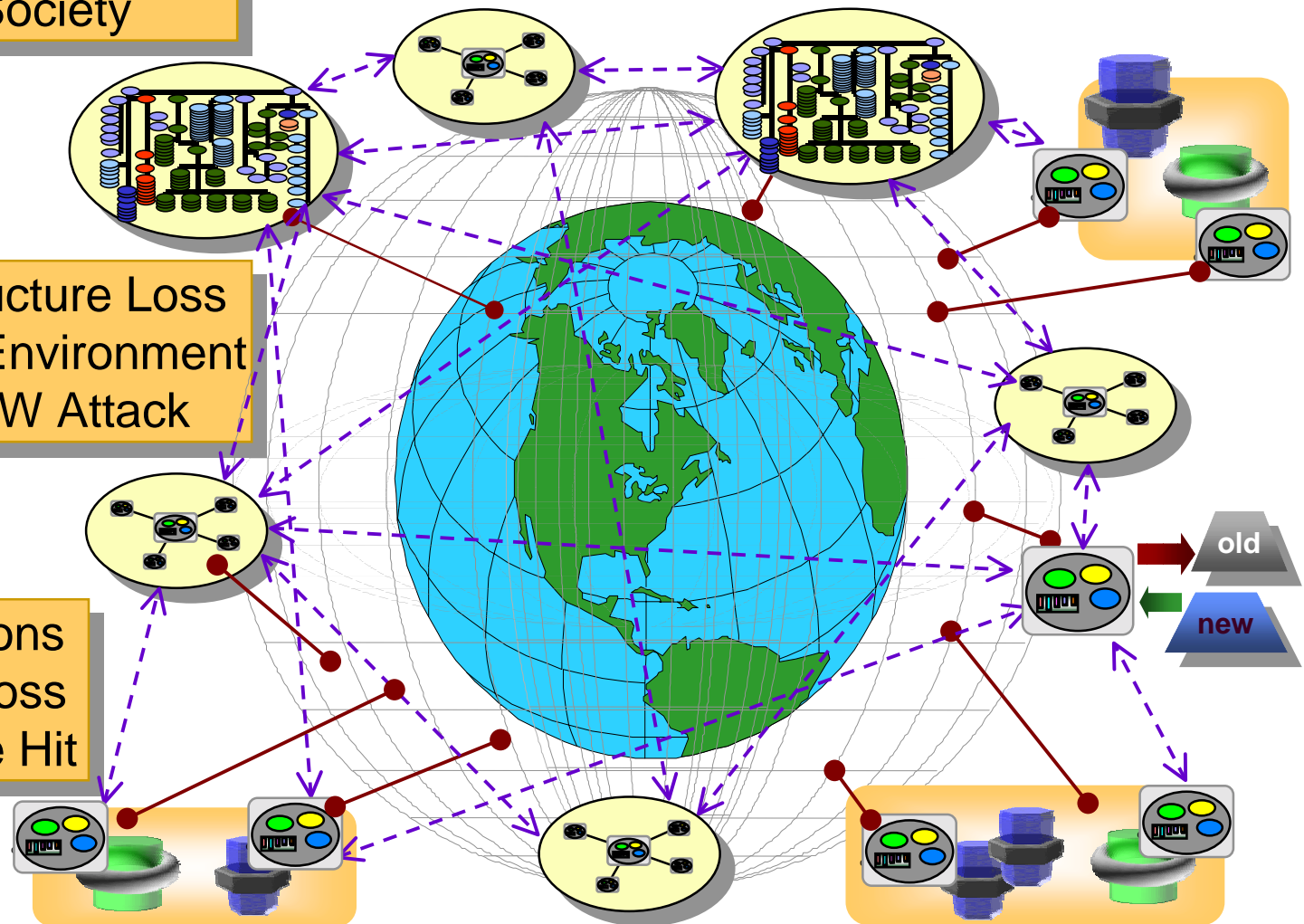Outgoing Directives

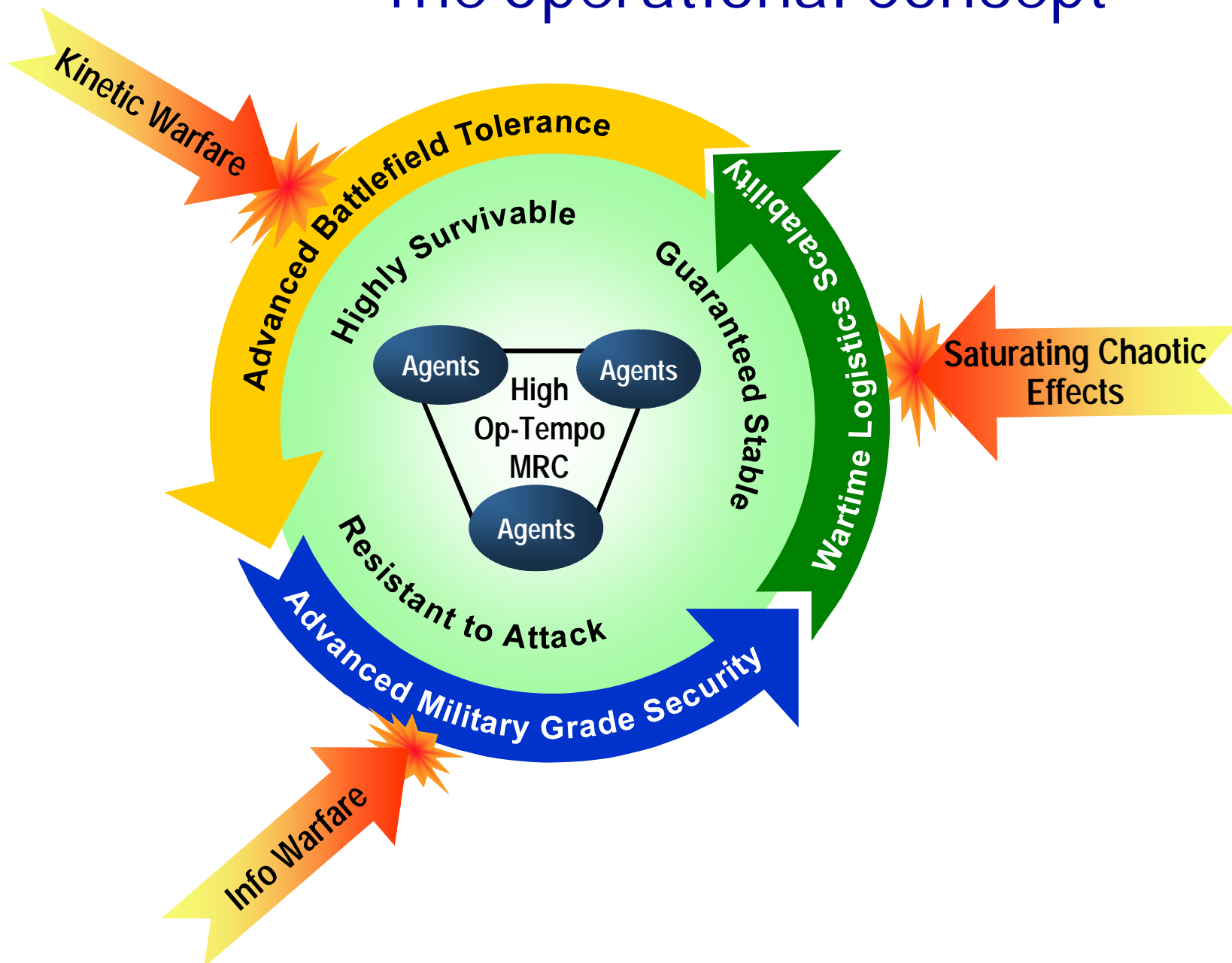Penalties & Exceptions

The Ultra*Log Challenge

Major Region Contingency
180 Days of Global Operations
> 1000 Agent Society

Up to 45% Infrastructure Loss
Extremely Chaotic Environment
Directed Enemy IW Attack

Survivable Operations
< 20% Capability Loss
< 30% Performance Hit

old

new

Extending the Cognitive Agent Architecture

Currently under ALP	Future with Ultra*Log
Basic Fault Tolerance ➤ Localized persistence of state ➤ Stable under intermittent comms ➤ Run-time manual reconfiguring	**Adv Battlefield Grade Tolerance** ➤ Dynamic comms-aware redundancy ➤ Catastrophic fault isolation / recovery ➤ Dynamic adaptation to environment *Highly Survivable*
Std Commercial Grade Security ➤ Signed JARS, applets, config files ➤ PKI certifications ➤ Inter-community VPNs	**Advanced Military Grade Security** ➤ Multi-layered, mode resistant security ➤ Assured, adaptive availability ➤ Assured data integrity / pedigree *Resistant to IW Attack*
Peacetime Logistics Scalability ➤ Time-phased locality of information ➤ Efficient simple negotiations ➤ Rich encapsulation of functionality ➤ Optimized task grammar / data model	**Wartime Logistics Scalability** ➤ Streamlined / compressed negotiation ➤ Variable fidelity adaptive processes ➤ Resource pooling / Mode mgmt *Guaranteed Stable*

Robustness

Security

Scalability / Stability

Project Objective

Large-Scale Distributed Agent Architecture for Logistics

Integrated System Solution for Agent Societies operating in Intense IW Environment

Conclusion

- The Ultra*Log BAA is out (www.darpa.mil)
- The first-round of proposals are coming in
- The BAA will be open for another year
- Want maximum participation from all sectors
- Seeking leading-edge technologies in security, robustness and scalability
- Goal is to enhance the COUGAAR (Cognitive Agent Architecture: www.cougaar.org) technology so it can support a massive-scale, trusted, distributed agent infrastructure for logistics